MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

PPS0016 – INTRODUCTION TO PROBABILITY AND STATISTICS

(All groups)

2 JUNE 2016
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTION TO STUDENT

1. This examination paper consists of **5 pages** (including the cover page) with **5 questions only**.

2. Each question is worth **20 marks. Attempt ALL questions.**

3. A normal distribution table is provided in the appendix.

4. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1

a) The following data represents the ages of people who take part in a popular TV quiz.

27.47	27.83	22.04	27.76
20.98	19.39	22.3	x
12.17	20.06	22.38	19.36
29.05	12.04	24.2	13.51
18.31	21.69	10.97	29.06

i) If the mean age is 21.42 years, find the value of x. [3 marks]

ii) Hence, find the median of the data. [3 marks]

b) The following sample data were collected from a survey:

32	38	26	29	32	41	28	31	45	36
45	35	40	30	31	40	27	33	28	30
30	41	39	38	33	35	31	36	37	32
23	45	39	37	38	36	33	35	42	38
34	22	37	43	52	32	35	30	46	36

i) Prepare a frequency distribution table as shown below. You may expand the rows as needed. Your table must consist 7 classes and each class must be of width 5. Use the smallest value in the data as the lower limit of the first class.

Class Limits	Class Boundaries	Class Midpoints, m	Tally	Frequency, f	mf	m^2f

[7 marks]

ii) Calculate the estimated **standard deviation** of the above grouped data. [3 marks]

iii) In the same diagram, draw a **histogram** and a **frequency polygon** from the frequency distribution table. [4 marks]

Question 2

a) The following table summarizes the types of Android games liked by students in a given lecture group:

Fast food(s)	Number of Students
Angry Birds only	10
Angry Birds and Candy Crush only	7
Plants vs Zombies and Candy Crush only	1
All three (Angry Birds, Candy Crush and Plants vs Zombies)	5

The total numbers of students who like Angry Birds and Plants vs Zombies are 30 and 18, respectively.

i) Draw a **Venn diagram** representing the above information. [3 marks]

ii) Determine the number of students who like Plants vs Zombies **only**. [2 marks]

b) Alison, Betty, Claire, Daphne and Emily are to sit in a row for a group picture. How many arrangements are possible if

i) there are no restrictions? [1 mark]

ii) Betty insists in sitting next to Emily? [3 marks]

iii) Betty and Claire must **not** sit together? [Hint: Use (i) and (ii)] [3 marks]

c) The assembly lines $X1$, $X2$ and $X3$ produce 20%, 45% and 35% of a factory's output, respectively. It is also known that the products from those lines show defects 15%, 25% and 10% of the time.

i) Draw the **probability tree** representing these information. [3 marks]

ii) A random part is sampled and found to be defective. What is the probability that it came from line $X3$? [5 marks]

Question 3

a) An electronics lab has in its storage 20 thermistors available for students to use, of which 3 are defective. A lab instructor randomly selects 4 thermistors to be distributed to students for them to use in the class. Let X be the number of defective thermistors selected by the instructor.

i) Prepare a probability distribution for X. Show all the steps. [8 marks]

ii) Find the probability that at most two thermistors selected were not defective.
[3 marks]

b) A random variable X has the probability density function defined as follows:

$$f(x)=\begin{cases} k(x+2x^2) & 0<x<3 \\ 0 & \text{otherwise} \end{cases}$$

i) Find the value of the constant k. [3 marks]

ii) Hence, find the variance of the random variable X. [6 marks]

Question 4

a) A university is known for its challenging entrance exam. Generally, for one intake, 62% of candidates will fail. If 20 candidates are sitting for the exam, find the probability that

i) **exactly one quarter** will fail, [3 marks]

ii) **at most** 17 will fail. [5 marks]

b) An officer from the Ministry of Health is collecting data on the distribution of cockroaches at a popular Cyberjaya food court. On average, the number of cockroaches per 10 square meters is 5. Using the appropriate probability formula, find the probability that, on a randomly selected area of 15 square meters, there will be 7 or 8 cockroaches. [6 marks]

c) The inductance values, L μH, of a given batch of inductors can be modeled by a normal distribution with mean 201 μH and standard deviation of 2.3 μH. Find $P(197 \le C \le 204)$. [6 marks]

Question 5

a) The distribution of star ratings given by critics for a given movie has a mean of 5.2 and a standard deviation of 1.9. A sample of 50 reviews is selected.

i) What is the probability that the average star rating of the sample is **below** 5? [6 marks]

ii) What theorem was used to solve part (i), and what condition allows its application? [2 marks]

b) The true proportion of smokers among all male citizens in Malaysia is 65%. A random sample of 25 male citizens is taken.

i) Find the sampling distribution of the sample proportion $\hat{p}$. [3 marks]

ii) What is the probability that less than 50% are smokers? [6 marks]

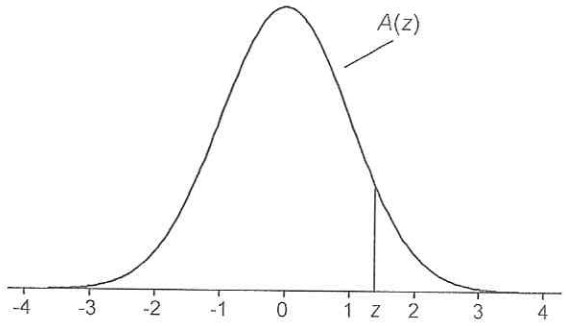
iii) What condition(s) had to be fulfilled in order to assume the normal distribution in this situation? [3 marks]

End of Paper

Appendix

TABLE A.1

Cumulative Standardized Normal Distribution



$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							